

14x22 Acoustic Treatment Preparations -

Alleviating Scrubbing Noise from the Test Section Floor

Florence Hutcheson, Daniel Stead, Jaye Moen
NASA Langley Research Center

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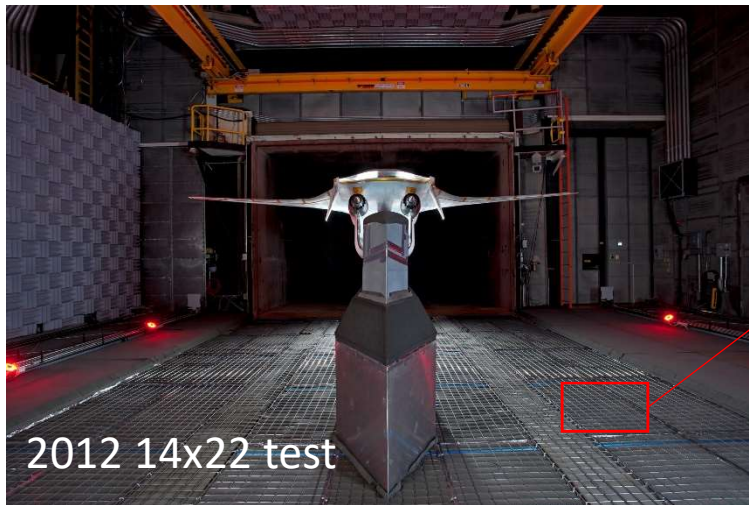


14x22 Modified Acoustic Floor Treatment

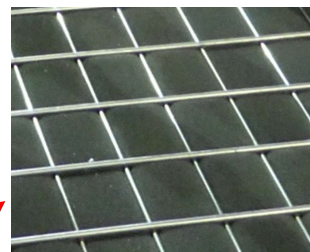
The acoustic floor treatment was modified to alleviate the scrubbing noise produced by the foam and grid:

- Perforated panels were welded to the top of the existing floor baskets.
- The initial design called for the perforated floor panels to be covered with a fine mesh but that was determined to be beyond available budget at the time.

Previously



Previously



Close-up of floor basket top

Currently



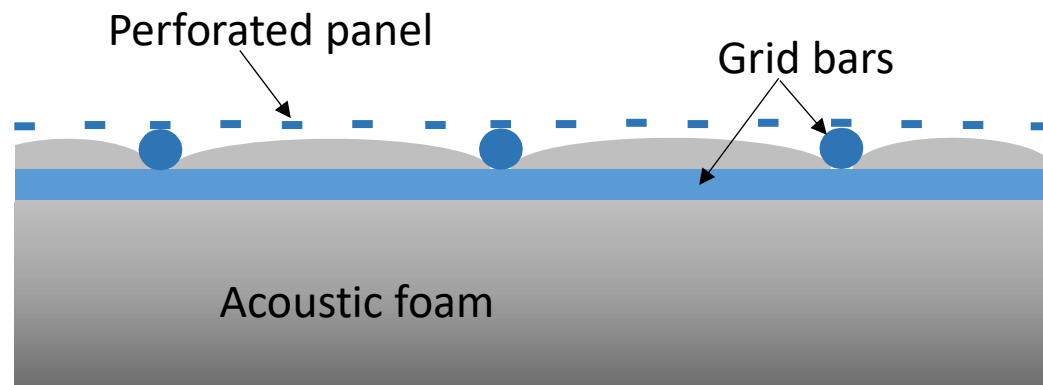
Floor basket top with welded perforated panel

Potential Concerns

- Although the addition of the perforated panels to the floor baskets is anticipated to reduce scrubbing noise in the high frequency range (above 20-25 kHz, based on past experiments), it may, however, also lead to an increase in noise at lower frequencies.
- Lower frequency noise could be exacerbated by the gaps present between the foam and the perforated panels (grid keeps the foam from being perfectly flush with the perforated panels).



Close-up of top of floor basket



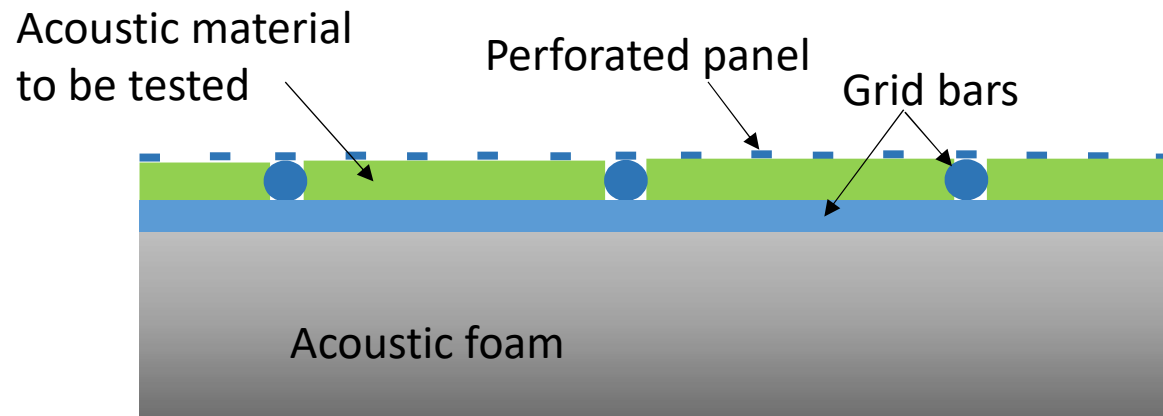
Cross section of top portion of floor basket



Quiet Flow Facility Scrubbing Noise Test

Objectives:

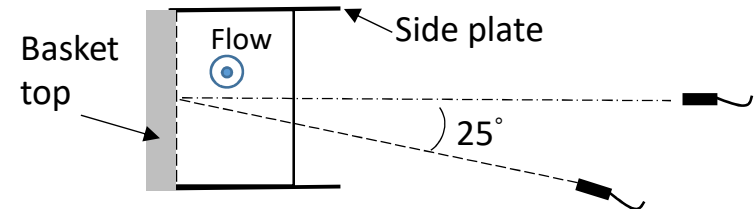
- Measure scrubbing noise from the current floor basket configuration.
- Determine benefit of inserting strips of acoustic material between perforated panel and grid bars for flush configuration. If beneficial, downselect best material to use.



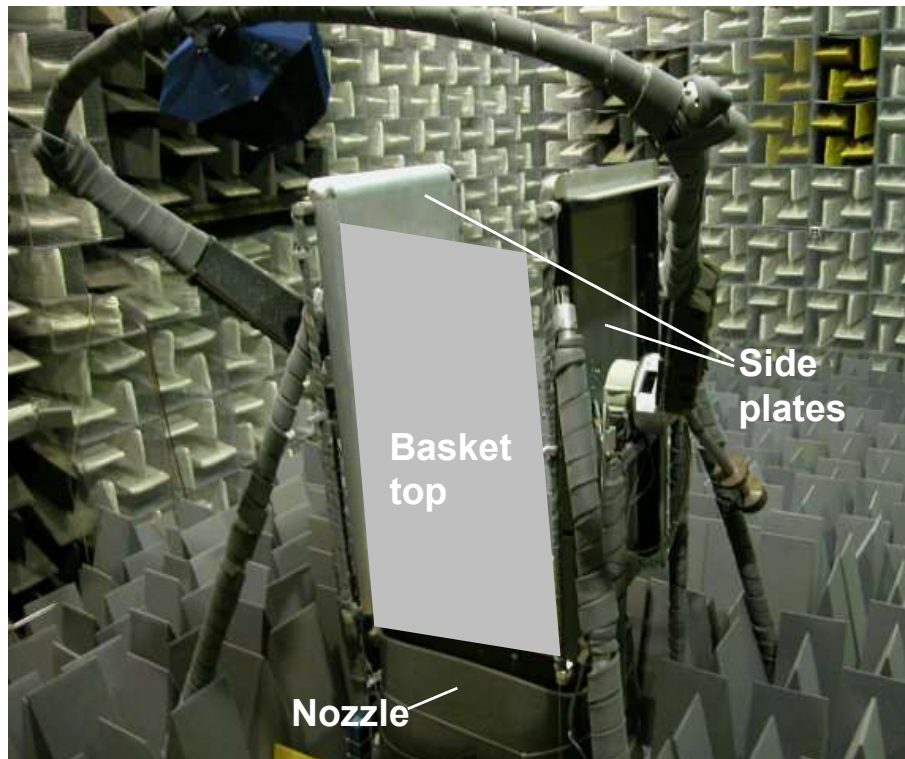
Cross section of top portion of floor basket

Quiet Flow Facility (QFF) Test Set-up

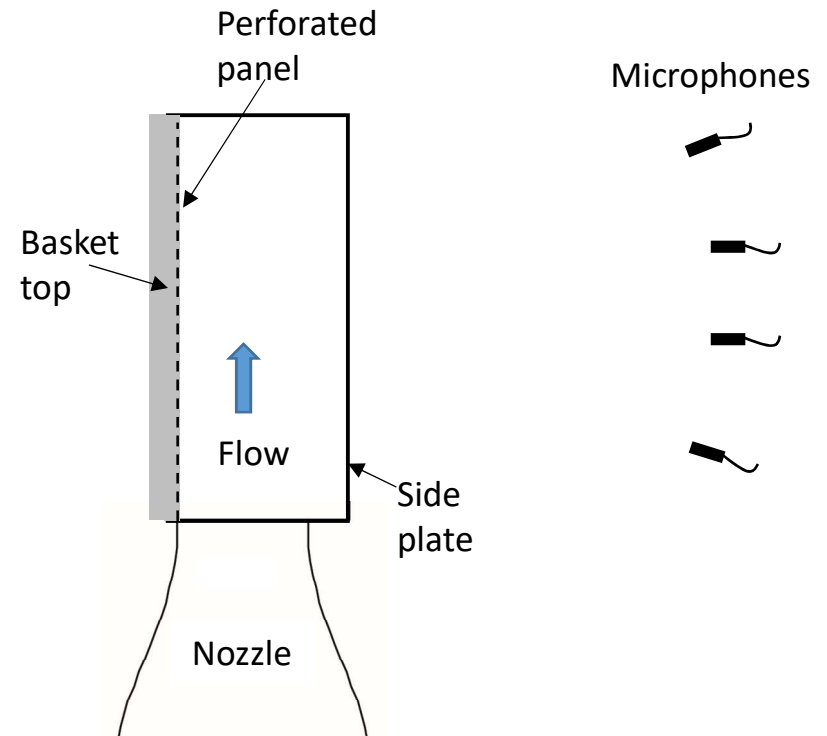
- Basket top installed as third wall of the QFF test section.
- Acoustic measurements obtained from microphones distributed in centerline plane as well as off to the side and for $0 \leq \text{Mach} \leq 0.17$.



Top view of test section

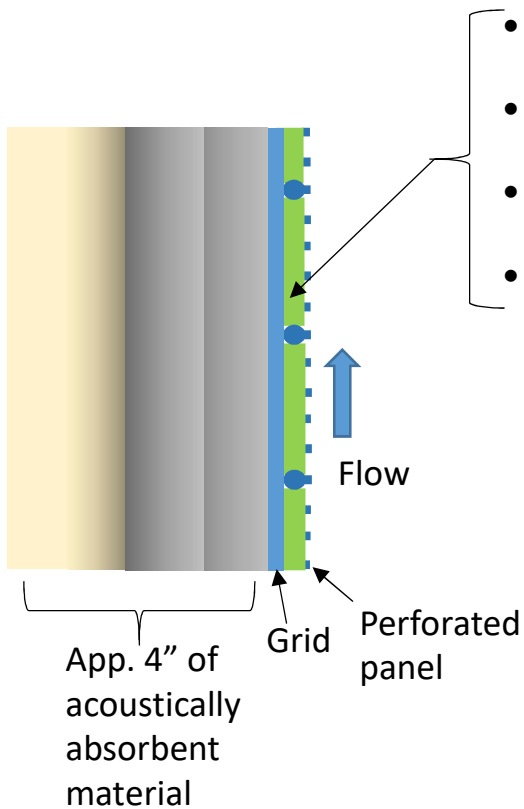


QFF test chamber

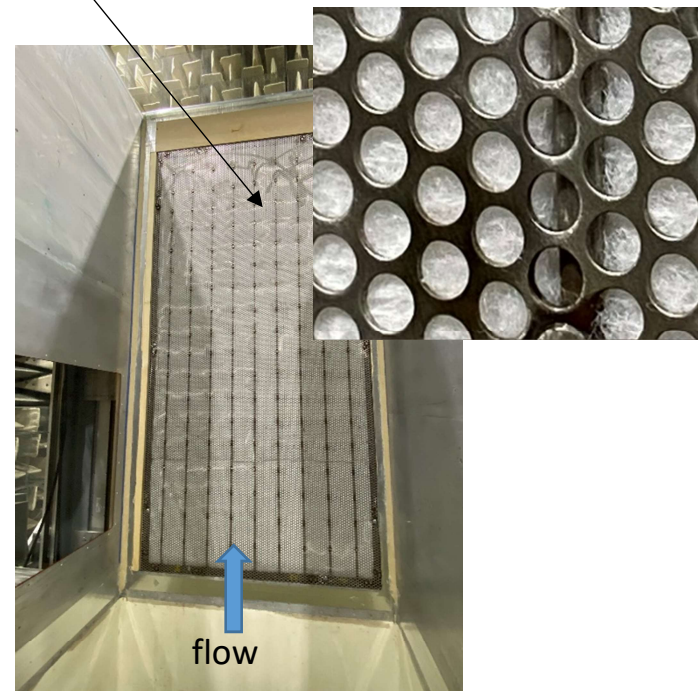
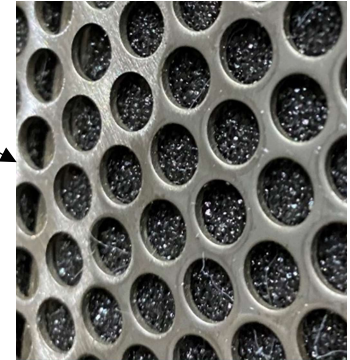


Side view of test section

Acoustic Material Tested



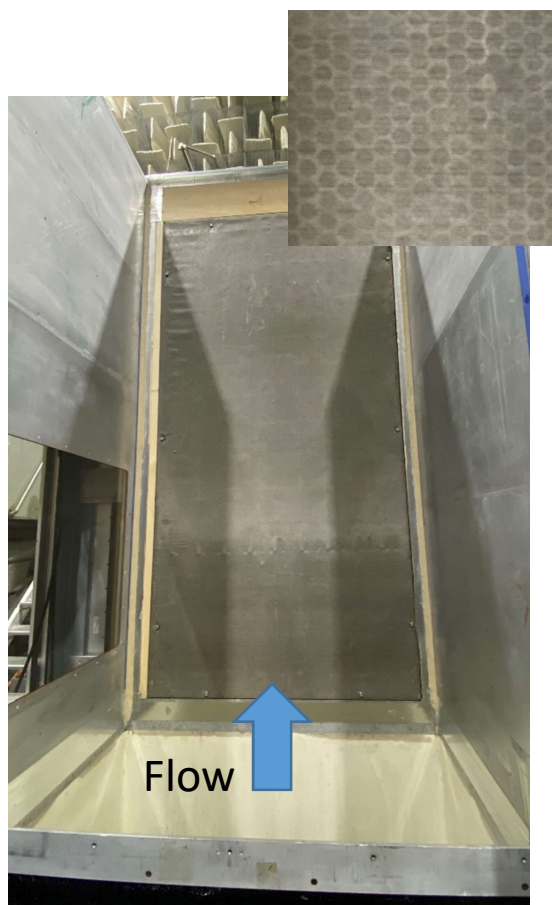
- 2 lb/ft³, 70 PPI (R200U) polyurethane foam
- 1.5 lb/ft³, 45 PPI reticulated foam
- 5 lb/ft³ polymax panel
- 7 lb/ft³ polymax panel



Cross section of basket top as installed in QFF

Basket top with polymax strips in QFF test section

Additional Configurations Tested



Basket top with fine screen spot welded to perforated panel



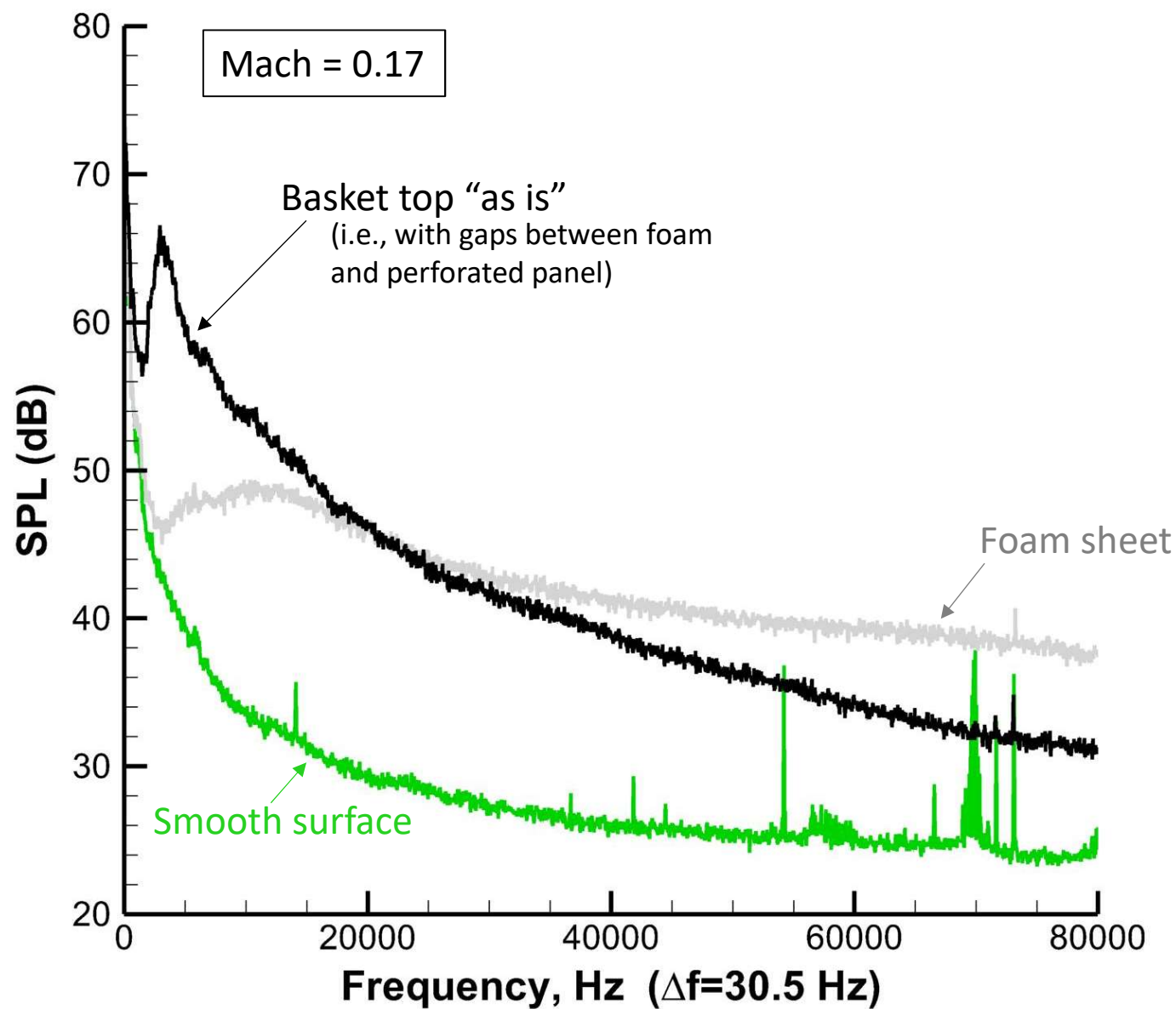
Plywood panel for "smooth surface" configuration



1" foam sheet glued to plywood panel

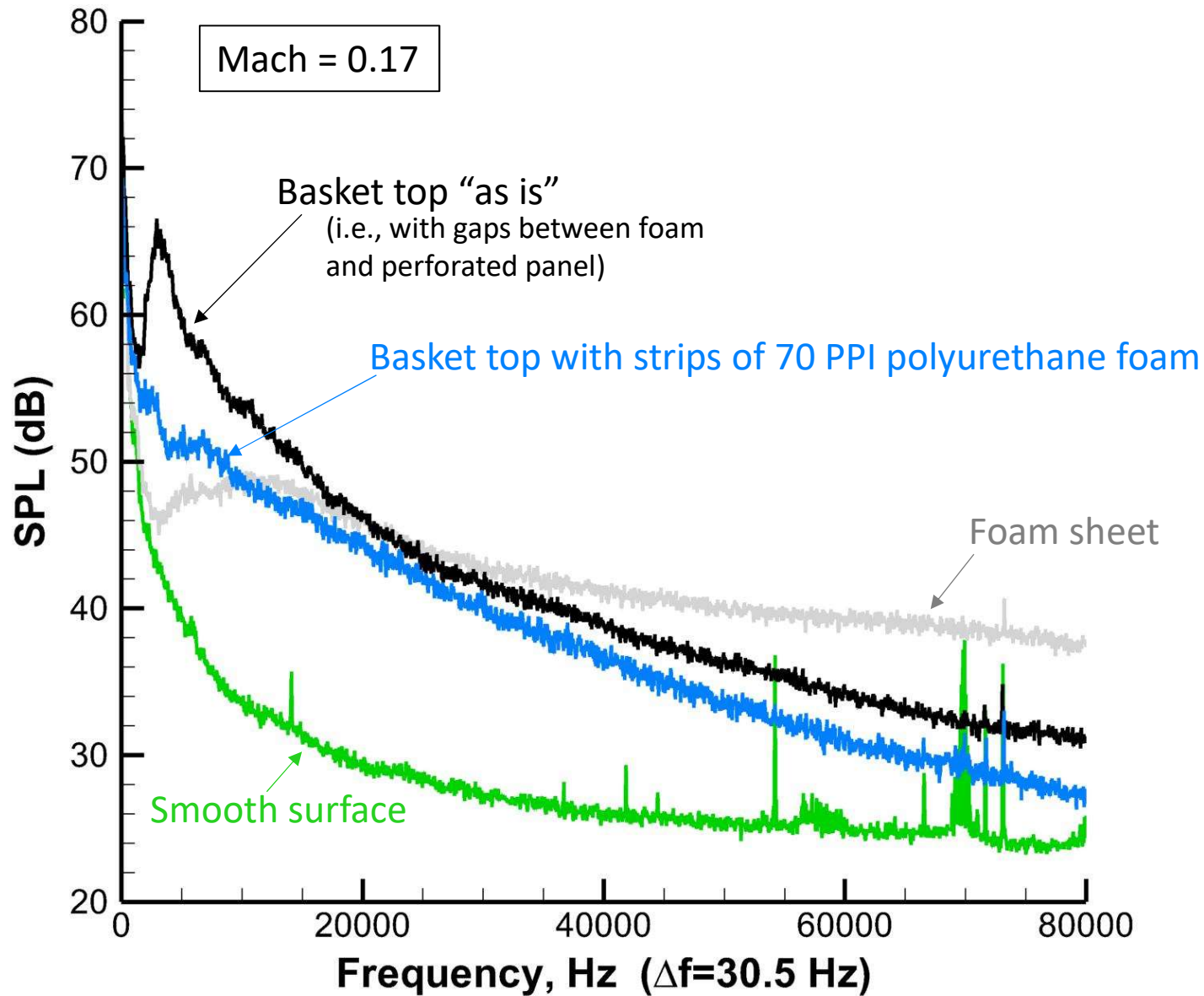


Test Results – Scrubbing Noise Spectra



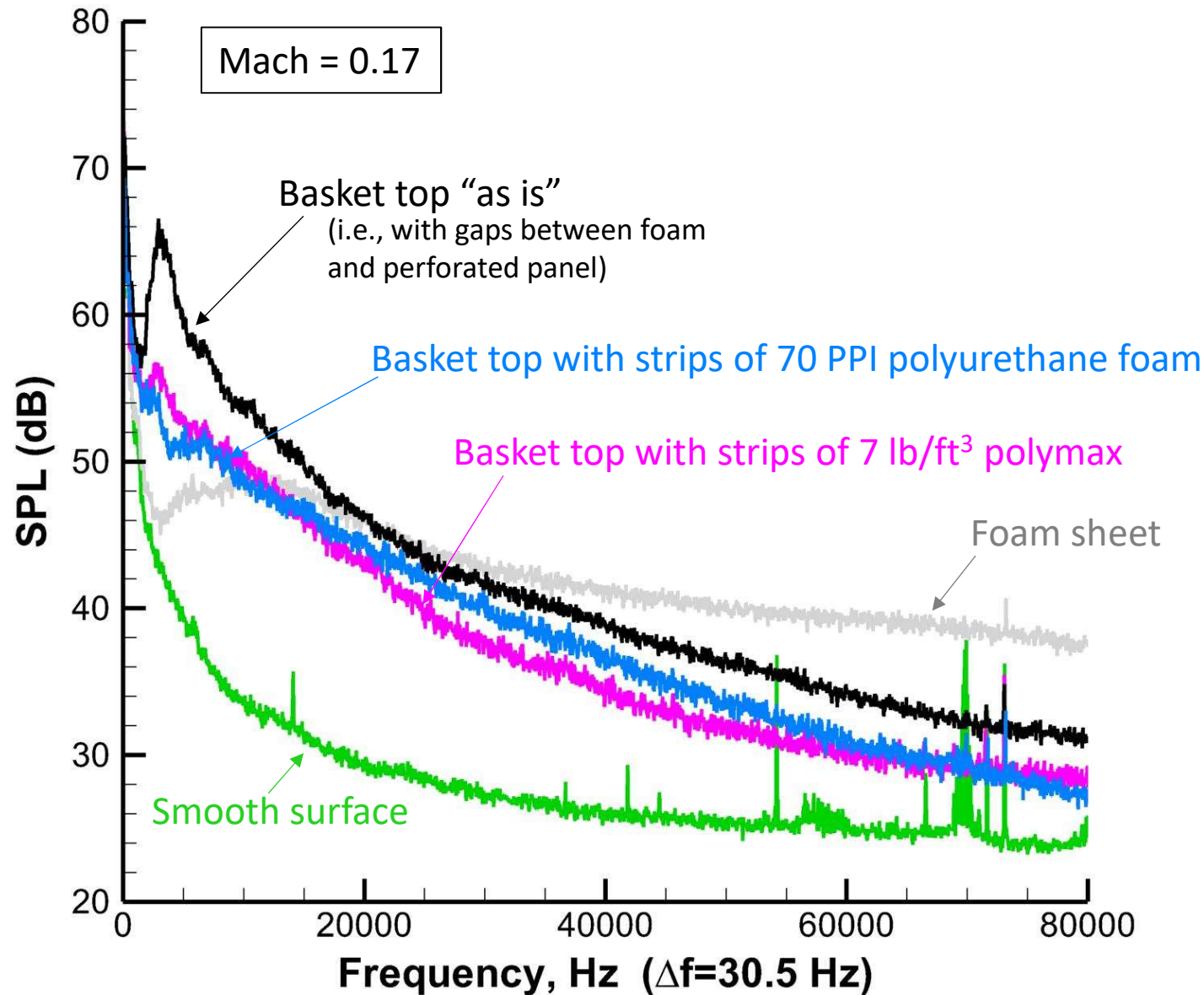


Test Results - Scrubbing Noise Spectra



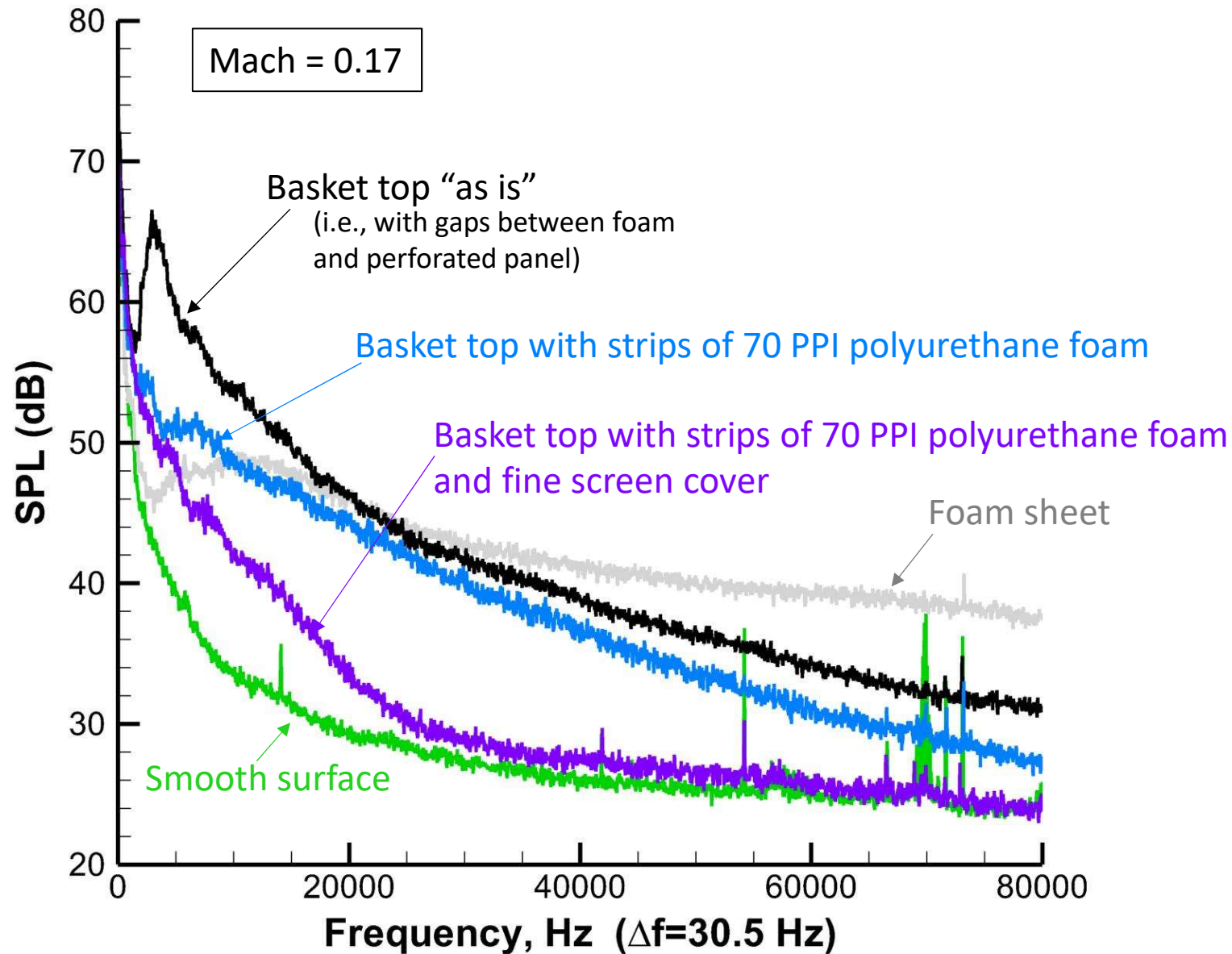


Test Results - Scrubbing Noise Spectra





Test Results - Scrubbing Noise Spectra





Summary

Key results:

- Acoustic foam is easier to work with (i.e., cut) than Polymax panels
- Inserting 0.25" thick strips of 2 lb/ft³, 70 PPI, R200U polyurethane foam between the perforated panels and the grid bars should significantly alleviate low frequency scrubbing noise for the current basket configuration.
- Adding a fine screen cover to the perforated sheet would further, and drastically, reduce scrubbing noise and is a capability enhancement that we should pursue.

Status:

- 80 sheets (0.25" thick) of the R200U foam were acquired to treat the 14x22 floor baskets. So far strips of the material have been installed in about 40 of the 80 basket tops.

Thank You!